

39147  
EB

SERVICE DATE – AUGUST 11, 2008

SURFACE TRANSPORTATION BOARD

DECISION

STB Ex Parte No. 664 (Sub-No. 1)

USE OF A MULTI-STAGE DISCOUNTED CASH FLOW MODEL IN DETERMINING THE  
RAILROAD INDUSTRY'S COST OF CAPITAL

AGENCY: Surface Transportation Board.

ACTION: Notice.

SUMMARY: The Board proposes to use a multi-stage Discounted Cash Flow (DCF) model to complement its use of the Capital Asset Pricing Model (CAPM) in determining the cost-of-equity component of the railroad industry's cost of capital.

DATES: Comments are due on or before September 15, 2008. Reply comments are due on or before October 14, 2008.

ADDRESSES: Comments may be submitted either via the Board's e-filing format or in traditional paper format. Any person using e-filing should attach a document and otherwise comply with the instructions at the E-FILING link on the Board's website at <http://www.stb.dot.gov>. Any person submitting a filing in the traditional paper format should send an original and 10 copies referring to STB Ex Parte No. 664 (Sub-No. 1) to: Surface Transportation Board, 395 E Street, S.W., Washington, D.C. 20423-0001.

FOR FURTHER INFORMATION CONTACT: Paul Aguiar, (202) 245-0323. [Assistance for the hearing impaired is available through the Federal Information Relay Service (FIRS) at 1-800-877-8339.]

SUPPLEMENTARY INFORMATION: Each year the Board measures the cost of capital for the railroad industry in the prior year. The Board then uses this cost-of-capital figure for a variety of regulatory purposes. It is used to evaluate the adequacy of individual railroads' revenues for that year.<sup>1</sup> It is also employed in cases involving rail rate review, feeder line applications, rail line abandonment proposals, trackage rights compensation cases, and rail merger review, as well as in our Uniform Rail Costing System (URCS).

---

<sup>1</sup> See 49 U.S.C. 10704(a)(2),(3); Standards for Railroad Revenue Adequacy, 364 I.C.C. 803 (1981), modified, 3 I.C.C.2d 261 (1986), aff'd sub nom. Consolidated Rail Corp. v. United States, 855 F.2d 78 (3d Cir. 1988).

The Board calculates the cost of capital as the weighted average of the cost of debt and the cost of equity, with the weights determined by the capital structure of the railroad industry (i.e., the proportion of capital from debt or equity on a market-value basis). While the cost of debt is observable and readily available, the cost of equity (the expected return that equity investors require) can only be estimated. How best to calculate the cost of equity is the subject of a vast amount of literature. Because the cost of equity cannot be directly observed, estimating the cost of equity requires adopting a finance model and making a variety of simplifying assumptions.

In Methodology to be Employed in Determining the Railroad Industry's Cost of Capital, STB Ex Parte No. 664 (STB served Jan. 17, 2008), the Board changed the methodology that it uses to calculate the railroad industry's cost of equity. We concluded that the time had come to modernize our regulatory process and replace the aging single-stage DCF model that had been employed since 1981. After a thorough rulemaking process, we decided to calculate the cost of equity using CAPM. During that process, several parties urged the Board to use a multi-stage DCF in conjunction with CAPM. We elected to adopt a stand-alone CAPM approach because the record in that proceeding did not support adopting any particular DCF model. But, we did not want to foreclose the possibility of augmenting CAPM with a DCF approach. As we explained in the January 2008 decision (footnotes omitted):

There may be merit to the idea of using both models to estimate the cost of equity. While CAPM is a widely accepted tool for estimating the cost of equity, it has certain strengths and weaknesses, and it may be complemented by a DCF model. In theory, both approaches seek to estimate the true cost of equity for a firm, and if applied correctly should produce the same expected result. The two approaches simply take different paths towards the same objective. Therefore, by taking an average of the results from the two approaches, we might be able to obtain a more reliable, less volatile, and ultimately superior estimate than by relying on either model standing alone.

Ultimately, both CAPM and DCF are economic models that seek to measure the same thing. CAPM seeks to do so by estimating the level of expected returns that investors would demand given the perceived risks associated with the company. By contrast, DCF models estimate the expected rate of return based on the present value of the cash flows that the company is expected to generate. Both approaches are plausible and intuitive, but are merely models.

The Federal Reserve Board noted in its testimony in STB Ex Parte No. 664 that “academic studies had demonstrated that using multiple models will improve estimation techniques when each model provides new information . . .”<sup>2</sup> There is, in fact, robust economic

---

<sup>2</sup> February 2007 Hearing Tr. at 18.

literature confirming that, in many cases, combining forecasts from different models is more accurate than relying on a single model.<sup>3</sup>

The record before us in STB Ex Parte No. 664 was insufficient for us to adopt a particular DCF model. But, it did illuminate a number of criteria to guide us in that effort. We issued an Advance Notice of Proposed Rulemaking, Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital, STB Ex Parte No. 664 (Sub-No. 1) (STB served Feb. 11, 2008) (ANPRM) in which we requested comments on the use of a multi-stage DCF model to complement the use of CAPM in determining the railroad industry's cost-of-capital. Specifically, we invited interested parties to submit comments on an appropriate multi-stage DCF for use in the Board's cost-of-equity determination. In the ANPRM, we identified the requirements that a multi-stage DCF model should satisfy.

First, and foremost, the proposed DCF model should be a *multi-stage model*. For cost-of-capital determinations for years 1981 through 2005, the agency relied on a single-stage DCF. That model required few inputs and few judgment calls, permitting the agency to promptly develop an estimate of the cost-of-equity component of the cost of capital. But its simplicity was due in part to an assumption that the 5-year growth rate would remain constant thereafter. That assumption proved problematic. In recent years, railroad earnings have grown at a very rapid pace, exceeding the long-run growth rate of the economy as a whole. While it is certainly possible that railroad earnings will continue to grow rapidly for many years, they cannot do so *forever* as the single-stage DCF model assumes. Thus, in years when the 5-year growth rate is very high, this model may overstate the cost of equity. Similarly, in years when the railroads experience a downturn and the predicted 5-year growth rate is very low, the model may understate the cost of equity.

Second, we noted in the ANPRM that the DCF model should not focus on dividend payments only. Finance theory suggests that the value of a firm should be independent of its dividend policy.<sup>4</sup> Although changes in dividends do influence stock prices, it is because these changes are "news" to the market. The market then responds in valuing the stock. It is the news, not the dividend distribution, that drives the change in prices. In addition, companies return profits to their shareholders in ways other than increasing dividends, including buying back

---

<sup>3</sup> See generally David F. Hendry & Michael P. Clements, Pooling of Forecasts, VII *Econometrics Journal* 1 (2004); J.M. Bates & C.W.J. Granger, The Combination of Forecasts in Essays in Econometrics: Collected Papers of Clive W.J. Granger. Vol. I: Spectral Analysis, Seasonality, Nonlinearity, Methodology, and Forecasting 391-410 (Eric Ghysels, Norman R. Swanson, & Mark W. Watson, eds., 2001); Spyros Makridakis and Robert L. Windler, Averages of Forecasts: Some Empirical Results, XXIX *Management Science* 987 (1983).

<sup>4</sup> See, e.g., Franco Modigliani & Merton H. Miller, The Cost of Capital, Corporation Finance, and the Theory of Investment, 48 *Am. Econ. Rev.*, 261-97 (1958). By integrating tax- and information-related considerations on capital structure and dividend policy choices, Modigliani and Miller greatly influenced subsequent developments in the field of finance. See Sudipto Bhattacharya, Corporate Finance and the Legacy of Miller and Modigliani, 2 *J. Econ. Perspectives* 135-47 (1988).

shares. As a result, we no longer think that a simple dividend distribution model is an acceptable framework for valuing firms. Rather, broader measures of cash flow or shareholder returns should be incorporated.

Third, the DCF model responsive to the ANPRM should be limited to those firms that pass the screening criteria set forth in Railroad Cost of Capital – 1984, 1 I.C.C.2d 989 (1985) (Railroad Cost of Capital -1984). Under those criteria, we include in the analysis only those Class I carriers that: (1) had rail assets greater than 50% of their total assets; (2) had a debt rating of at least BBB (Standard & Poors) and Baa (Moody's); (3) are listed on either the New York or American Stock Exchange; and (4) paid dividends throughout the year. A Class I railroad is one having annual carrier operating revenues of at least \$250 million in 1991 dollars. 49 CFR 1201.1-1. Those criteria tend to result in establishing the cost of capital for an efficiently run railroad firm, on which data are readily and transparently available.

Fourth, we sought a multi-stage DCF model that, when used in combination with CAPM, would enhance the precision of the resulting cost-of-equity estimate, one that over a sufficiently lengthy historical analysis period would result in a combined forecast with a lower variance than a forecast relying on the CAPM approach alone.

In response to the ANPRM, the Board received comments from Arkansas Electric Cooperative Corporation (AECC); the Association of American Railroads (AAR) and the Western Coal Traffic League (WCTL).

AAR and WCTL each proposed multi-stage DCF models. AAR's proposed model satisfied all of the four fundamental requirements identified by the Board in the ANPRM. AAR's model is a multi-stage DCF. Its cash flow component is broader than models using only dividends. It is limited to the four carriers that meet the Board's screening criteria, and it reduces variance in estimating the cost of equity as compared to using the CAPM approach alone.

WCTL submitted a multi-stage DCF model and asserted that such a model could provide further validation of the CAPM results. However, WCTL asserted that it did not believe the Board should receive and consider evidence concerning multi-stage DCF calculations along with CAPM calculations as part of our annual railroad industry cost-of-capital determinations at this time. WCTL suggested that we revisit this matter in five years.

AECC did not submit a model in response to the ANPRM, but deferred to the WCTL. AECC did express the opinion that the use of a multi-stage DCF model in conjunction with CAPM could enhance the precision of the resulting cost-of-equity estimate.

### **PROPOSED RULE**

For the reasons set forth below, the Board proposes to determine the cost of equity of the railroad industry by using the average of the estimate produced by the CAPM model and the Morningstar/Ibbotson multi-stage DCF model identified by AAR.

The Morningstar/Ibbotson model meets the four requirements we established in the ANPRM. It employs three different growth rates of the railroads meeting the Board's criteria. Stage 1 represents the first 5 years. In each year of Stage 1, the growth rate used is the median value of the three-to-five-year growth estimates for the qualifying railroads as provided to Morningstar by railroad industry analysts. Stage 2 represents years 6 through 10. In Stage 2, the growth rate is the average of the earnings growth for the qualifying railroads taken as a whole. Stage 3 begins with year 11 and continues thereafter. The growth rate in Stage 3 is assumed to be the long-run nominal growth rate of the aggregate U.S. economy. This three-tier approach eliminates the problem posed by a single-stage DCF model which could overstate the cost of equity by assuming a constant growth rate. The precise equation that describes the Morningstar/Ibbotson multi-stage DCF model is set forth in the submission by the AAR.<sup>5</sup>

The model also meets the second requirement that it not limit future cash flows to dividend payments alone. Rather, the model incorporates a wider array of cash flows for equity investors by applying expectations of earnings growth to the firms' cash flows, not just actual dividends. Thus, it accounts for all of the relevant cash flows a reasonable investor is likely to anticipate, including share repurchases and earnings' reinvestments to obtain greater future cash flows, along with dividends. The Morningstar/Ibbotson model includes the impact of capital expenditures on a firm's cash flow.

The Morningstar/Ibbotson model meets our third requirement, as it can be modified to use only those firms that pass the screening criteria set forth in Railroad Cost of Capital – 1984.

And AAR has demonstrated that the model satisfies our fourth requirement. When combined with CAPM and applied over a sufficiently lengthy historical analysis period, the Morningstar/Ibbotson multi-stage DCF model enhances the precision of the resulting cost-of-equity estimate with a lower variance than a forecast relying on the CAPM approach alone. For the period 1998 through 2006, for the four Class I railroads meeting the Railroad Cost of Capital - 1984 standards, the Morningstar/Ibbotson model produces a cost of equity ranging from 11.6% to 14.6%, while the CAPM yields estimates between 9.7% and 12.7%. Averaging the estimates from the two models yields estimates in the range between 11.1% and 13.4%. The standard deviation for both the Morningstar/Ibbotson model and the CAPM model is 0.92 while the standard deviation of the average of the two models is only 0.75. As such, using the average of both CAPM and the multi-stage DCF model produces a more stable and more precise cost-of-equity estimate.

Finally, the Morningstar/Ibbotson model is a commercially accepted multi-stage DCF model. It was developed by disinterested, respected third parties and created for use by the financial community in evaluating publicly traded equities and in making real-world investment decisions. It was not developed as a tool for litigation or advocacy, and the same model is used by Morningstar to estimate the cost of equity for hundreds of different industries. The model's variables can be estimated from publicly available data, and here can be applied to those railroads that meet the Board's selection criteria. While there may well be a variety of other

---

<sup>5</sup> See AAR V.S. of Stangle at 10.

multi-stage DCF models – each with different assumptions and inputs – that might satisfy the four requirements set forth in our notice, we believe it is prudent to use an approach that was not developed simply as a tool for litigation before the Board, but rather to use an approach that has been tested in the marketplace and is used to estimate the cost of equity for different industries, not just the rail industry. For this reason, we are proposing to use the Morningstar/Ibbotson model, rather than the model developed and proposed by WTCL.

Interested parties are invited to comment on the proposed use of the Morningstar/Ibbotson model in conjunction with CAPM. Parties should also comment on the best way to integrate the two approaches and whether a simple average is the best approach.

This action will not significantly affect either the quality of the human environment or the conservation of energy resources.

Board decisions and notices are available on our website at “[WWW.STB.DOT.GOV](http://WWW.STB.DOT.GOV).”

Decided: August 7, 2008.

By the Board, Chairman Nottingham, Vice Chairman Mulvey, and Commissioner Buttrey.

Anne K. Quinlan  
Acting Secretary

## APPENDIX

The cost of equity for each firm ( $r_i$ ) in the Morningstar/Ibbotson three-stage DCF model is the solution to the following equation:

$$MV_{i0} = \sum_{t=1}^5 \frac{CF_{i0}(1+g_{i1})^t}{(1+r_i)^t} + \sum_{t=6}^{10} \frac{CF_{i5}(1+g_{i2})^{(t-5)}}{(1+r_i)^t} + \frac{\frac{IBEI_{i10}(1+g_{i3})}{r_i - g_{i3}}}{(1+r_i)^{10}}$$

Where,

$MV_{i0}$  = market value of firm  $i$  in year 0 (i.e., the year for which the cost of equity is being estimated)

$CF_{it}$  = average cash flow for firm  $i$  at the end of year  $t$

$g_{ij}$  = earnings growth rate for firm  $i$  in stage  $j$  ( $j = 1, 2$ , or  $3$ ).

$IBEI_{10} = IBEI_0 (1+g_1)^5 (1+g_2)^5$

$IBEI_0$  is determined by the same process as  $CF_0$

The industry cost of equity ( $R$ ) for the three-stage DCF model is computed as the market value weighted average of the individual firm cost of equity estimates:

$$R = \sum_{i=1}^N s_i r_i ,$$

Where,  $s_i$  is firm  $i$ 's share of the total industry market value and  $N$  is the number of firms in the industry composite, such that:

$$s_i = (MV_{0i}) / \sum_{i=1}^N MV_{0i}$$